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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/931,490	08/16/2001	Richard F. Haglund JR.	22000.0116U2	3671

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EXAMINER	
SODERQUIST, ARLEN	

ART UNIT	PAPER NUMBER
1743	

DATE MAILED: 03/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/931,490	HAGLUND ET AL.	
	Examiner	Art Unit	
	Arlen Soderquist	1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *30 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45,47-64,66-78 and 80* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *30-32,47-64 and 67-76* is/are allowed.

6)☒ Claim(s) *1-29,33-45,77,78 and 80* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-2, 11, 15-17, 20-22, 77-78 and 80 are rejected under 35 U.S.C. 102(b) as being anticipated by Hillenkamp (US 5,118,937). In the patent Hillenkamp teaches and claims infrared laser desorption of biomolecules for mass spectrometric analysis using a liquid matrix of lactic acid, glycerol or triethanolamine. Tables 1-2 also give several solid matrix materials for use at UV and infrared frequencies. Figures 1-4 show systems for the mass spectral analysis. In figure 4, Hillenkamp shows arrows that would normally be depicted when sample support 23 is movable.

3. Claims 1-5, 11-12, 15-22, 77-78 and 80 are rejected under 35 U.S.C. 102(e) as being anticipated by Hunter (US 6,104,028). In the patent Hunter teaches volatile matrices for matrix-assisted laser desorption/ionization mass spectrometry. The materials have hydroxy functionalities and because of their volatility are cooled below room temperature by liquid nitrogen (column 6, lines 15-21). Column 6 lines 58-65 teaches that the photoabsorbing molecule can have a wavelength in the range from approximately 200 to 20,000 nm which covers the ultraviolet to infrared frequencies (column 10, lines 33-38). Columns 7-8 discuss the pulsed nature of the desorption. Column 3, line 2 incorporates the teachings of the above Hillenkamp reference into Hunter

4. Claims 1-2, 11-12, 15-17, 20-22, 77-78 and 80 are rejected under 35 U.S.C. 102(b) as being anticipated by Krutchinsky. In the paper Krutchinsky discusses thin-layer chromatography/laser desorption of peptides followed by multiphoton ionization time-of-flight mass spectrometry. The location of the separated compounds of GlnTrp/GlyTyr and pentagastrin/gramicidin D peptide model mixtures on silica gel and cellulose thin-layer

chromatography plates has been examined by laser desorption multiphoton ionization time-of-flight mass spectrometry. The multiphoton ionization mass spectra of neutrals desorbed by sequential scanning of the thin-layer chromatography plates vs. the infrared laser spot allowed imaging of the distribution profile of the compounds. The method appeared to be promising for the analysis of thin-layer chromatograms. Page 376 in the first full paragraph teaches changing the position of the probe tip relative to the desorbing laser spot.

5. Claims 1-2, 6-9, 11-17, 20-23, 28-29, 33-37, 39-45, 77-78 and 80 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Loo (Analytical Chemistry 1996, newly applied). In the paper Loo teaches interfacing polyacrylamide gel electrophoresis with mass spectrometry. An apparatus and method are described for acquiring mass spectra directly from electrophoretic gels, without electroelution or electroblotting. The method relies upon ultrathin polyacrylamide gels that dry to thicknesses of 10 μ and that have the additional advantages of rapid preparation and run times. Spectra were acquired from isoelectric focusing, native, and SDS gels. It is also possible to run virtual 2-dimensional gels in which proteins are resolved in the 1st dimension on the basis of their charge while the 2nd-dimension is matrix-assisted laser-desorption ionization mass spectrometry instead of SDS gel electrophoresis. A simple mixture of proteins is analyzed by this approach. The authors examine the products of CNBr digestion in-gel and demonstrate its utility for peptide mapping applications. The mass spectrometer is described as having a 100 position sample support that has been modified to hold a 4 cm X 4 cm gel to handle the whole gel.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 3-5 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krutchinsky as applied to claims 1-2, 11-12, 15-17, 20-22 and 77-80 above, and further in view of Hunter as explained above. Krutchinsky does not teach cooling the sample.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the cooling step of Hunter into the apparatus and method of Krutchinsky because of the ability to desorb molecules from volatile matrices over a wide range of irradiation wavelength as taught by Hunter.

8. Claims 6-10, 13-14, 23-29 and 33-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krutchinsky as applied to claims 1-2, 11-12, 15-17, 20-22 and 77-80 above, and further in view of Strahler. Krutchinsky does not teach polyacrylamide matrices as the separation medium.

In the paper Strahler teaches development of methods for the charge-derivatization of peptides in polyacrylamide gels and membranes for their direct analysis using matrix-assisted laser desorption-ionization mass spectrometry. Approaches are being developed for the interfacing of matrix-assisted laser desorption-ionization (MALDI) mass spectrometry with PAGE, in which laser-irradiated samples desorb directly from a gel, or from a membrane on which gel-separated polypeptides have been transferred. Whether one- or two-dimensional electrophoretic separations have been performed, preparations for the MALDI experiment must optimize detection of the analytes present and the generation of structural information. Procedures have been developed for forming charged derivatives of peptides in solution. When subjected to MALDI analysis, these charged derivatives produce ions in some cases where the underivatized peptide would not yield a response. The ions fragment following acceleration and yield informative and simple post-source decay (PSD) spectra. The development of approaches to interfacing this chemistry with MALDI directly from gels and membranes is presented.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the electrophoretic separation of Strahler in the Krutchinsky method and device because of its recognized ability to separate biological molecules. It would have been obvious to

one of ordinary skill in the art at the time the invention was made to optimize a results effective variable such as the irradiation wavelength because the Court has held that such optimization is within the skill of one of ordinary skill in the art (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)).

9. Claims 10, 24-27 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loo as applied to claims 1 or 23 above, and further in view of Cramer. Loo teaches the use of sinapinic acid (experimental section) as the molecule used to cause the volatilization, but does not teach the use of a free electron laser for volatilization.

In the paper Cramer teaches infrared matrix-assisted laser desorption and ionization by using a tunable mid-infrared free-electron laser. Initial results of IR matrix-assisted laser desorption/ionization (IR-MALDI) mass spectrometry of proteins by using the Vanderbilt free-electron laser as the source of selective vibrational excitation are reported. The ability of this laser to initiate desorption and ionization by excitation of specific vibrational modes is demonstrated. For the first time it is shown that IR-MALDI mass spectrometry at wavelengths other than those available from conventional fixed-frequency IR lasers, i.e., 2.79(Er:YSGG), 2.94 (Er:YAG), and 9.3-10.6 mm (CO2), is feasible and exhibits similar performance. IR-MALDI mass spectra were taken in the wavelength ranges 2.8-4 and 5.5-6.5 mm, covering the absorption bands of the O-H and C=O stretch vibrations typical of many organic compounds such as succinic acid, fumaric acid, or nicotinic acid, which were used as matrixes in these studies. A comparison between these results and Er:YAG/YSGG MALDI data are given. The potential of IR-MALDI at wavelengths near the C=O stretch vibration and the possibilities for studies of the IR-MALDI mechanisms by using this kind of tunable source are discussed.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the free electron laser of Cramer or the other infrared emitting lasers that were compared with it in the device and method of Loo because of their known ability to volatilize molecules from matrices using wavelengths near the C=O stretch vibration that would be part of an organic acid molecules as shown by Cramer.

10. Claims 30-32, 47-64 and 66-76 are allowed.

11. Applicant's arguments filed December 30, 2003 have been fully considered but they are not persuasive. Relative to the anticipation rejections examiner points out that the term medium is nonspecific and therefore could include or only have common matrix materials used in matrix assisted laser desorption ionization as the medium composition. One of the reasons that MALDI works is that the laser is tuned to or overlaps a resonant frequency for the vibrations of the matrix material. If applicant wishes examiner to read the term medium as equivalent to electrophoresis gel (or gel), the claims should specifically claim it. Otherwise the examiner will continue to interpret the term "medium" as found in claim 1 to be fully inclusive of the MALDI matrix materials found in each of the references. With reference to this reasoning examiner has applied the Loo reference from Analytical Chemistry that was cited by applicant as clearly anticipatory of claims that specifically claim the polyacrylamide medium and those which are more general in scope. Additionally, examiner's position is that there is no difference for anticipation purposes between choosing a laser frequency to meet the properties of the "medium" and choosing the "medium" or a component of the "medium" to have the required properties of the laser that one has available until one clearly defines the component of the "medium" for which the frequency is being selected. Relative to the movement of the medium on the sample support, figure 4 of Hillenkamp shows arrows that are consistent with the sample being movable back and forth, Hunter incorporates the teachings of the Hillenkamp reference, Krutchinsky teaches changing the position of the probe tip relative to the desorbing laser spot and Loo teaches a 100 position sample support. Additionally the specific example(s) of the specification is only that, an example, and the claims are examined without reading in the specific example(s) into the claims. Thus the claims are of scope that is not commensurate with the specific examples in the specification. Relative to the combination of Krutchinsky and Strahler, the claims do not require that the "medium" contain only polyacrylamide or that the vibrational frequency is that of polyacrylamide. Thus the "medium" can contain other things such as a matrix material and the frequency can be any component of the "medium".

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art relates to mass spectral analysis of electrophoresis separated molecules.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose current telephone number is (571) 272-

1265 as a result of the examiner moving to the new USPTO location. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Arlen Soderquist

March 10, 2004

ARLEN SODERQUIST
PRIMARY EXAMINER